

STATE OF MINNESOTA
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Subject: Union Lake / Lake Sarah Drawdown Operations

Comments:

Mike,

As you requested last week, enclosed is the operating plan for the subject project in Polk County. Pumping is prohibited between December 31 and April 16 each year. If you have further questions, please contact me. Thanks. Chad

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Union Lake / Lake Sarah Outlet Pump, Forcemain, and Downstream System Operation Manual

**Sand Hill River Watershed District
and
Union Lake / Sarah Improvement District**

Chapter 1

Project Description

Flooding is occurring on Union and Sarah Lakes in Polk County, Minnesota. The lakes have fluctuated as much as 5 - 6 feet above the Ordinary High Water Level. Dozens of cabins have been ruined, damaged, or are threatened, and almost all properties (approximately 286) are suffering from high water damage. 56 properties on these two lakes have been devalued a total of \$860,900 by the Polk County Assessor.

The urgency of the Union Lake/ Sarah flooding situation was finally realized through several meetings with concerned property owners, the Red Lake Watershed District (RLWD), Sand Hill River Watershed District (SHRWD), Red River Watershed Management Board (RRWMB), Department of Natural Resources (DNR), Pollution Control Agency (PCA), Board of Water and Soil Resources (BWSR), Polk County, the Lake Improvement District (ULSID), East Polk SWCD, U.S. Corps of Engineers (Corps) and many others. This process involved an analysis of several of the most obvious alternatives that were pre-selected and agreed upon by the above participants. The alternatives consisted of various surface water outlets and/or upstream watershed storage and watershed management strategies.

In addition to suggested alternatives, other apparent outlet alternatives were considered. Initially, all the outlet alternatives were assessed on the basis of general criteria. Each alternative was then presented to the Technical Committee. Each alternative was subjected to an evaluation of several factors including:

- potential environmental impacts
- regulatory complexity (RLWD - SHRWD, DNR, MPCA, etc.)
- political implications
- hydraulic impacts to downstream systems
- water quality issues
- type of outlet (gravity, pumped)
- cost
- technical feasibility

Flood Damage Reduction alternatives such as buyouts, relocation, and watershed management strategies are not considered to be cost effective for Union and Sarah Lakes.

The Union Lake / Sarah Improvement District Board has approved a pumping alternative as recommended in the feasibility study, originating from the southwest area of Union Lake. The basic components of this alternative involve construction of a pumping station at/in Union Lake, and installation of 2,500 feet of buried forcemain crossing under CR 42 and going across USF&W land. The forcemain would outlet into a natural basin with an existing outlet. This natural outlet follows a course to a point near the center of Section 3 in Garden Township, where there is an opportunity to divert the water into another drainage system.

Chapter 2

Operating Plan

2.1 Authorities

The Union Lake / Sarah Lake level reduction and stabilization project was established and constructed by the Union Lake / Sarah Improvement District (ULSID) under the jurisdiction of the Polk County Board of Commissioners.

Permits for construction of the project were granted by the Department of Natural Resources (DNR), Corps of Engineers, Sand Hill River Watershed District (SHRWD), East Polk SWCD, and other agencies. During the permit review process, the operating plan was developed in conjunction with the Red River Basin Flood Damage Reduction Mediation process. Participants included the Union Lake / Sarah Improvement District, Sand Hill River Watershed District, MnDNR, Corps of Engineers, Board of Water and Soil Resources, MnPCA, West Polk SWCD, and others. This operating plan is subject to further review at the request of the above participants, and changes to this operating plan must be agreed to by the above participants.

The SHRWD is responsible for operation of the pump and diversion gate. The SHRWD and the ULSID are jointly responsible for inspection, monitoring, and overall management of the project. However, the ULSID is fiscally responsible for maintenance of the project.

2.2 Downstream Control Points and Elevations

The operation of the outlet pump will depend on the downstream system's ability to handle pumped and local flows. The water surface elevations (flow) at two specific control points in downstream channels will be used to determine whether or not the pump may be operated. The occurrence of downstream channel erosion is an additional factor when determining if the pump may be operated. If flows at either control point exceed the maximum allowed elevation or if erosion is documented downstream, the pump must be turned off and gate closed. The two control points and the erosion criteria are:

1. Two 36" CMP culverts located at a north-south township road crossing just north of the center of Section 10 in Garden Township. The water surface elevation shall not exceed .5 foot above the crown (top) of the pipes. Pumping may resume when the water surface elevation drops to .5 feet below the crown of the pipe.

2. The water surface elevation at the USGS gage in Climax, MN shall not exceed 12 feet. Pumping may resume when the water surface elevation drops to 11 feet.
3. If reports of overland flow over exposed soil or downstream channel erosion are received, the pump must be turned off and an inspection shall take place to substantiate the concern. A DNR, SHRWD, and ULSID representative shall inspect the site(s). If it is determined that the Union and Sarah Lake outlet project (pumped water) contributes to the cause of the erosion, the pump must remain off until the eroding area is stabilized. Costs associated with the repair of the erosion shall be the responsibility of the ULSID.

2.3 Pump / Gates / Diversions

Pumps: The pump station and controls are located in the southwest area of Union Lake in the SW ¼, Section 35, Woodside Township. The system operation and capacity has been designed in two phases. The first phase will consist of a large pump discharging approximately 20 cubic feet per second (~9,000 gallons per minute) during the "drawdown phase" of the lake level stabilization effort. Once target levels have been achieved, a smaller pump with a capacity less than 10 cfs (4,500 gpm) will be installed to manage lake levels as needed during the "maintenance phase."

- **Drawdown Phase:** During this phase, the pump will be operated at capacity as long as the maximum downstream water surface elevations listed above are not exceeded or downstream erosion does not occur. Once the target elevation of 1211.6 feet is achieved, the drawdown phase will end.
- **Maintenance Phase:** It is not anticipated that the maintenance pump will be operated on a continuous basis. Instead, the lakes will be allowed to fluctuate naturally within specified parameters. These parameters are a minimum control elevation of 1211.6 feet and a maximum control elevation of 1212.6 feet, at which point maintenance pumping will begin. The maintenance pump will operate once levels achieve the 1212.6 feet level, keeping in mind the downstream maximum elevations and erosion concerns. The maintenance pumping will be stopped when lake levels are lowered to 1211.6 feet. Fine tuning of the optimum lake levels and pump operation trigger levels and procedures will be the subject of future discussions, and will require the written approval of the MnDNR. Prior to initiation of the maintenance pumping phase, a meeting will be held between the Corps of Engineers, SHRWD, LID, and MnDNR to discuss the relevance of the maintenance phase plan after reviewing conditions experienced during the drawdown phase.

Pump operation will include the latitude, within the above parameters, to begin or end pumping for reasons such as downstream erosion control or general system maintenance. Winter pumping (pumping between November 1 and April 15) will not be allowed.

Diversion and Gate: The outlet route follows an existing watercourse to the Center of Section 3 in Garden Township. At this location the pumped flows are diverted into an inlet ditch and culvert. This culvert is fitted with a control gate. This gate shall be open while the pump is operating. When pumping is discontinued, the gate shall be closed 24 hours after the pump is shut off. The gate shall remain closed until pumping resumes. During the drawdown phase, sandbags shall be placed across the natural waterway west of the diversion, between the diversion and Bungham Lake. These sandbags are intended to facilitate passage of all pumped flows into the diversion drop inlet.

Chapter 3

System Operations

Water levels on Union and Sarah Lakes are the product of both short term and long term climatic and hydrologic conditions. While the lake levels may rise and fall relatively slowly, the same is not true for the downstream systems. It is imperative that system operations be well coordinated between the SHRWD and the ULSID. Working relationships and assignments must be arranged prior to pump operation. Care must be taken to observe the downstream trigger levels during spring runoff and after local rainfall events.